

LEAVING CERTIFICATE EXAMINATION, 1969

APPLIED MATHEMATICS - PASS

Not more than six questions may be answered.
 All questions are of equal value.
 Mathematical Tables may be obtained from the Superintendent.

1. A stone is thrown vertically upwards from ground level with an initial velocity of 100 ft. per sec. Find
 - (i) the greatest height reached;
 - (ii) the time the stone takes to return to ground level;
 - (iii) the times after projection at which the stone is at a height of 100 feet.

2. The maximum speed of an airship in still air is 100 m.p.h. Find the maximum speed with which it can travel due north if there is a north-east wind blowing at 30 m.p.h.

3. A uniform rod AB is 10 inches long and weighs 2 lb. The rod is supported horizontally by two vertical strings, one attached to it at C and the other at D, where AC = 1 inch and BD = 2 inches. Find the tension in each of the strings.
 Where should a mass of 4 lb. be attached to the rod so that the tension in the string at C would be twice the tension in the string at D ?

4. Find in feet per second per second the retardation (supposed constant) of a train whose speed decreases from 60 miles per hour to 30 miles per hour in 1,320 ft. Assuming the retarding forces to remain the same, find how much farther the train moves before coming to rest.

5. A horizontal force of 3 lb. wt. will just cause a block weighing 5 lb. to move along a rough plane when the plane is horizontal. Find the coefficient of friction between the block and the plane.
 If the plane were tilted to make an angle of 20° with the horizontal, what is the least force acting along the line of greatest slope of the plane that would just cause the block to move up the plane ?

6. A piece of uniform wire is bent so as to form an isosceles triangle ABC in which AC = BC = 5 inches and AB = 8 inches. Find the distance of the centre of gravity from the base AB.
 If the wire is suspended at A so that it hangs freely, what angle will AB make with the vertical ?

7. State the principle of conservation of momentum. If a $\frac{1}{2}$ ton gun discharges a 100 lb. shot horizontally with a velocity of 1,000 ft. per second, find the uniform resistance necessary to stop the recoil of the gun in 1 foot.

8. A rectangular trough, 3 feet long and 2 feet wide, is filled to a depth of 4 feet with a liquid of specific gravity 0.7. Find the total thrust of the liquid on the base of the trough.
 A block of wood of specific gravity 0.4, having a volume of 1.2 cubic feet, is then allowed to float on the liquid. Find (i) the increase in the total thrust on the base, (ii) the increase in height of the level of the liquid.
 (A cubic foot of water weighs 62.5 lb.)

9. Forces of 3, 5, 6 lb. wt. act along the lines OA, OB, OC respectively, the angles AOB, BOC, AOC being 60° , 90° , 150° respectively. If R is the resultant of the three forces, find
 - (i) the components of R along OB and along OC;
 - (ii) the magnitude of R, correct to one decimal place;
 - (iii) the angle which the line of action of R makes with OB.